

## CLAIMS

What is claimed is:

1. A global positioning system receiver system comprising:  
5 an electronics assembly comprising a frequency reference for use in demodulating a received global positioning system radio signal;  
an antenna coupled to said electronics assembly for receiving said global positioning system radio signal;  
an enclosure to contain said electronics assembly; and  
10 a system of shock mounting within said enclosure to enable said electronics assembly to receive and process to produce a position fix said global positioning system radio signal while said enclosure is mounted on a blade of earth moving equipment.

15 2. The apparatus as described in Claim 1 wherein said earth moving equipment comprises a dozer.

3. The apparatus as described in Claim 1 wherein said earth moving equipment is comprises a grader.

20 4. The apparatus as described in Claim 1 wherein said earth moving equipment is comprises a plow.

5. The apparatus as described in Claim 1 wherein said earth moving  
25 equipment is comprises a scraper.

6. The apparatus as described in Claim 1 wherein said system of shock mounting comprises a plurality of wire-rope isolators.

5 7. The apparatus as described in Claim 5 wherein said plurality of wire-rope isolators mount to a plurality of interior surfaces of said enclosure that form an acute angle with a plane of said electronics assembly.

8. The apparatus as described in Claim 6 wherein said acute angle is  
10 about 45 degrees.

9. The apparatus as described in Claim 1 wherein said electronics assembly comprises a printed circuit board of greater than about 0.075 inches thick.

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10. A shock mounted electronics system comprising:  
a support member operative to resist flexure;  
an electronics assembly comprising a frequency reference;  
a plurality of wire rope isolators coupling said support member to an  
20 enclosure; and

wherein said support member is rigidly coupled to that portion of said electronics assembly comprising said frequency reference.

11. The apparatus of Claim 10 wherein said support member comprises  
25 die cast aluminum.

12. The apparatus of Claim 10 wherein said support member comprises a non-solid metal construction.

5 13. The apparatus of Claim 10 wherein said frequency reference comprises a quartz crystal.

14. The apparatus of Claim 10 wherein said electronics assembly comprises a radio frequency receiver.

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15. The apparatus of Claim 13 wherein said electronics assembly comprises a global positioning system receiver.

16. The apparatus of Claim 10 wherein said wire rope isolators are  
15 mounted at about 45 degrees to the plane of said electronics assembly.

17. The apparatus of Claim 10 wherein said electronics assembly comprises components mounted on both surfaces of a printed circuit board.

20 18. The apparatus of Claim 10 operating rigidly mounted to a blade of an earth moving equipment.

19. The apparatus of Claim 10 wherein said electronics assembly comprises a printed circuit board of greater than about 0.075 inches.

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20. The apparatus of Claim 10 wherein said support member is an integral component of a radio frequency shielding system.

21. A support member for mounting an electronics assembly in a severe shock and vibration environment comprising:

a plurality of first mounting points to couple to wire rope isolators;

a plurality of second mounting points to couple to a printed circuit

board;

wherein at least two of said plurality of second mounting points are

in close proximity to a frequency reference mounted to said printed circuit

board; and

wherein at least a portion of said support member directly contacts said printed circuit board under said frequency reference.

22. The apparatus of Claim 21 wherein said printed circuit board comprises components on both surfaces.

23. The apparatus of Claim 21 wherein said frequency reference comprises a quartz crystal.

24. The apparatus of Claim 21 wherein said first mounting points are at about 45 degrees to the plane of said printed circuit board.

25. The apparatus of Claim 21 wherein said support member comprises die cast aluminum.

26. The apparatus of Claim 21 wherein said support member comprises a non-solid metal structure.

5 27. The apparatus of Claim 25 wherein said non-solid metal structure comprises aluminum.

28. The apparatus of Claim 21 wherein said support member is an integral component of a radio frequency shielding system.

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29. A method of manufacturing a shock resistant device comprising:  
attaching a printed circuit board assembly comprising a frequency  
reference to a rigid member, wherein said attaching comprises a plurality  
of attachment points in close proximity to said frequency reference;  
15 coupling said rigid member to a plurality of wire rope isolators; and  
mounting said plurality of wire rope isolators to a protective  
enclosure.

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30. A method as described in Claim 29 wherein said printed circuit board  
20 assembly comprises electronic components on first and second surfaces of said  
printed circuit board assembly.

31. A method as described in Claim 29 wherein said rigid member is an  
integral component of a radio frequency shielding system.

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32. A method as described in Claim 29 wherein said printed circuit board assembly is directly contacted by said rigid member opposite said frequency reference.

5           33. A method as described in Claim 29 wherein said rigid member comprises a non-solid metal construction.

34. A method as described in Claim 29 wherein said printed circuit board assembly comprises a radio frequency receiver.

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35. A method as described in Claim 29 wherein said rigid member comprises die cast aluminum.